

## ABSTRACT

*In modern telecommunication systems, backhaul has a very important role to connect gNodeB devices with the core network. The network design in Pegunungan Bintang includes a 5G New Radio network and a backhaul network that can support the natural potential management system by utilizing the Internet Of Things (IOT) system. 5G NR network specifications use a frequency of 2300 MHz, use a bandwidth of 100 MHz, and with an NSA (NonStand Alone) network architecture. The backhaul network uses fiber optic technology.*

*5G design is carried out using coverage and capacity techniques. From the calculation and simulation of the coverage technique design, the results obtained are 220 gNodeB and 22 backhaul. Meanwhile, the capacity technique results in 25 gNodeB and 5 backhaul. Based on the capacity engineering cost structure there is a calculation of Capital Expenditure (CAPEX) with an initial investment of Rp 50,149,601,606.16, Operational Expenditure (OPEX) costs for 5 years, and Revenue based on ARPU and market users. The economic analysis resulted in a Net Present Value (NPV) value of Rp 132,405,523,391.00, an Internal Rate of Return (IRR) value of 15%, a Payback Period (PP) value of capital return in 2.27 years, a Profitability Index (PI) value of 1.57, a positive Return On Investment (ROI) value and an Accounting Rate Of Return (ARR) value of 72%. In the feasibility analysis of cellular network coverage technique is more feasible based on Key Performance Indicator (KPI) parameters with Reference Signal Received Power (RSRP) value of -90.23 dBm, Signal to Interference Noise Ratio (SINR) value of 24.88 dB, and Downlink Throughput value of 232.076 kbps. And in the feasibility analysis of backhaul with optical fibre is feasible to be implemented based on ITU-T G.984.1 parameters with a power link budget value of -13.06 dBm, an average rise time budget value of 12.2 ps, and an average BER value of less than  $10^{-9}$ .*

**Keywords:** *Techno-economics, 5G NR (New Radio), IRR, NPV*